Analysis of Short-Repeat-Interval Spaceborne Interferometric SAR Data of Kilauea, Hawaii

Howard A. Zebker, Paul A. Rosen, and Scott Hensley
Jet Propulsion Laboratory
California Institute of Technology
Pasadena. CA 91109

We have obtained data from the SIR-C/XSAR spaceborne radar system acquired during the October, 1994 mission over the Kilauea region of the Big Island of Hawaii, and processed these to form several interferometric observation pairs. Data were acquired on days 7, 8, 9, and 10 of the mission at both the L-band (24 cm) and C-band (6 cm) wavelengths, permitting generation of interferograms at two frequencies with temporal separations of 1, 2, and 3 days. The terrain is quite varied, including arid deserts, barren lava fields and active flows, and dense tropical forests. The accuracy of the shuttle navigation was such that spatial baselines of around 100 m were achieved for all pairs.

We will, by the time of this presentation, have analyzed several new phenomena affecting interferometric measurements and their applications. Three main experiments form this study: i) temporal decorrelation issues, ii) changes in the mean phase between frequencies in vegetated regions, important for topographic radar frequency selection, and iii) analysis of residual phases when the data are applied to surface deformation studies. Specifically, we will examine temporal decorrelation and the estimated interferometric phase over the various terrains, both as a function of frequency and temporal baseline. Also, we will present an error analysis of the differential interferograms at both the L-band and C-band wavelengths, a result needed to quantify the sensitive measurements of deformation afforded by radar interferometry.